

Calusacypraea, A New, Possibly Neotenic Genus of Cowries (Gastropoda: Cypraeidae) from the Pliocene of Southern Florida

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ABSTRACT

The new cypraeid genus *Calusacypraea* n. gen. is described from the Okeechobean Sea region of Pliocene southern Florida. This new genus is unusual among American fossil cowries in that it bears many juvenile shell characters into adulthood and possibly represents a neotenic evolutionary offshoot of *Siphocypraea*. Based on paleoecological inferences, *Calusacypraea* was an inhabitant of shallow water lagoonal and estuarine environments and became extinct at the end of the Pliocene with the obliteration of the Okeechobean lagoonal systems. Three new *Calusacypraea* species are described: *C. briani* n. sp. (from Petuch Unit 7), *C. duerri* n. sp. (type of the genus, from Petuch Unit 10), and *C. tequesta* n.sp. (from Petuch Unit 4). The previously described species, *C. sarasotaensis* (Petuch, 1994), is included in this new genus.

Key words: Cypraeidae, *Calusacypraea*, Pliocene, Florida.

INTRODUCTION

Southern Florida has long been known to house the largest Pliocene cowrie fauna found anywhere in the United States. The works of Heilprin (1886), Mausfield (1931), Olsson and Petit (1964, 1968), Parodiz (1988), and Petuch (1986, 1991, 1994), altogether, show that the ecosystems of the Okeechobean Sea region of Pliocene Florida (Petuch, 1994:26) contained at least 23 different cowrie species. With the exception of one species of *Pseudozonaria*, all were thought to belong to a single endemic genus, *Siphocypraea* Heilprin, 1886. The southern Caribbean Gatunian cowries previously placed in *Siphocypraea* are now placed in *Baryeypraea* (*Muracypraea*). This classic Okeechobean genus radiated into numerous neritic habitats during the late Pliocene, but became extinct in the early Pleistocene. The genera *Macrocypraea* and *Luria* later replaced *Siphocypraea* in the local reef communities (Petuch, 1994:11).

Recently, studies of new collections of fossil cowries from the Quality Aggregates, Inc., quarries at Sarasota (housed at Florida Atlantic University) have shown that there existed a second endemic cowrie genus in the Plio-

cene Okeechobean Sea. This previously-overlooked genus, here named *Calusacypraea*, bears many juvenile characters into adulthood (so much so that I discarded numerous choice adult specimens, thinking that they were merely juvenile or subadult *Siphocypraea* species!). This new, possibly neotenic, genus and its new species are described and discussed here.

SYSTEMATICS

Superfamily Cypraeoidea Rafinesque, 1815

Family Cypraeidae Rafinesque, 1815

Genus *Calusacypraea* new genus

Diagnosis: Cypraeid shells of average to large size, ranging from 35 to 70 mm in length, extremely inflated, thin, delicate, bulliform; apices characteristically very depressed, forming distinct apical pit; posterior edge of lip typically highly-developed, greatly-projecting beyond plane of spire; columellar side of apical area poorly-developed, only slightly projecting beyond plane of spire; anterior extremities poorly developed, without distinct projecting beaks; ends of anterior extremities do not extend beyond end of anterior canal, producing rounded, blunt, sheared-off appearance; in some species, anterior extremity on labial side almost absent, with extremity blending into rounded end of lip and giving shell juvenile appearance; bases of shells very rounded; margins of shells poorly-developed, rounded, with only thin enamel deposits; anterior canal thickened, bordered by prominent enamel collar; apertures proportionally narrow, variably widening toward anterior end; columellar teeth proportionally small, thin, and narrow, extending along length of columella; some species with row of obsolete, secondary teeth developed along anterior end of columella; labial teeth well-developed, confined to edge of lip; fossula nonexistent; color pattern (when preserved) composed of numerous small, closely-spaced dots on dorsum.

Type Species: *Calusacypraea duerri* Petuch, new species, lower Pinecrest Beds (Petuch Unit 10), Tamiami

Formation, Piacenzian Pliocene of southern Florida, U.S.A.

Other Species Assigned to *Calusacypraea*: *Calusacypraea briani* Petuch, new species, Pinecrest Beds (Petuch Unit 7), Tamiami Formation; *Calusacypraea sarasotaensis* (Petuch, 1994), Pinecrest Beds (Petuch Unit 3), Tamiami Formation; *Calusacypraea tequesta* Petuch, new species, Pinecrest Beds (Petuch Unit 4), Tamiami Formation.

Stratigraphic Range: At present, known only from the Piacenzian Pliocene of southern Florida (Pinecrest Beds, Tamiami Formation).

Etymology: Named for the Calusa Indian tribe of pre-Columbian southern Florida.

Remarks: *Calusacypraea* is most closely related to the sympatric genus *Siphocypraea* and probably represents a neotenic evolutionary offshoot of this sister group. The new genus differs from *Siphocypraea* in consistently having much thinner, more delicate, and much more inflated shells with a distinctly juvenile appearance (an example of neoteny?). The anterior extremities of *Siphocypraea* are well-developed and flange-like, with most species having the extremities formed into large, greatly-projecting beaks that extend beyond the end of the siphonal canal (Figure 9). In *Calusacypraea* the anterior extremities are distinctly truncated and poorly developed, never extending beyond the end of the siphonal canal, a morphology generally seen only in juvenile cowries. In some species of *Calusacypraea* (such as *C. sarasotaensis*) the extremities are asymmetrically developed, with the labial extremity being virtually unformed and blending into the curvature of the lip, much as in a juvenile.

The greatest differences between *Calusacypraea* and *Siphocypraea* are seen in the posterior area of their shells. In *Siphocypraea*, the posterior extremities are well-developed and symmetrical, with the columellar extremity projecting as much or nearly as much as the labial extremity and characteristically forming a deep, narrow, and curved apical sulcus (Figure 11). In *Calusacypraea* the columellar posterior extremity is nearly obsolete, being represented by only a thin, angled, bladelike keel. Unlike *Siphocypraea*, *Calusacypraea* species lack the curved, narrow apical sulcus, having, instead, a proportionally small, sharply-defined, deeply-impressed apical pit (Figure 10).

Ecologically, *Calusacypraea* species appear to have occupied a different niche than did *Siphocypraea* species. Without exception, all four known species of the new genus have only ever been found in muddy-sand, extreme nearshore facies of the Pinecrest Beds. These depositional environments imply estuarine conditions, and

Calusacypraea may have represented a neotenic offshoot of *Siphocypraea* that had evolved to live in the extensive brackish water lagoons (such as the paleoestuary of the proto-Myakka River) that fringed the entire western coast of the Pliocene Floridian peninsula (Petuch, 1994, Fig. 10). With the onset of the late Pliocene glacioeustatic regressive sequences, these estuarine environments were obliterated and the ecologically-narrow genus became extinct.

The descriptions of three new *Calusacypraea* species are given here, along with the description of the only previously-known species, *C. sarasotaensis* (Petuch, 1994). The holotypes are deposited in the Invertebrate Paleontology collections of the Florida Museum of Natural History, University of Florida, Gainesville, Florida, and bear UF numbers.

Calusacypraea briani new species
(figures 1, 2)

Description: Basic morphology as for genus; shell large for genus, elongated and subcylindrical; aperture narrow, widening slightly at anterior end; columellar lip with 22 small, narrow teeth; columellar teeth sub-obsolete toward posterior end, becoming stronger and better-developed toward anterior end; outer lip with 26 small but well-developed teeth; base of shell rounded; margins poorly developed; apical pit deep, surrounded by raised apical collar; posterior columellar extremity small but well-developed, narrow and bladelike.

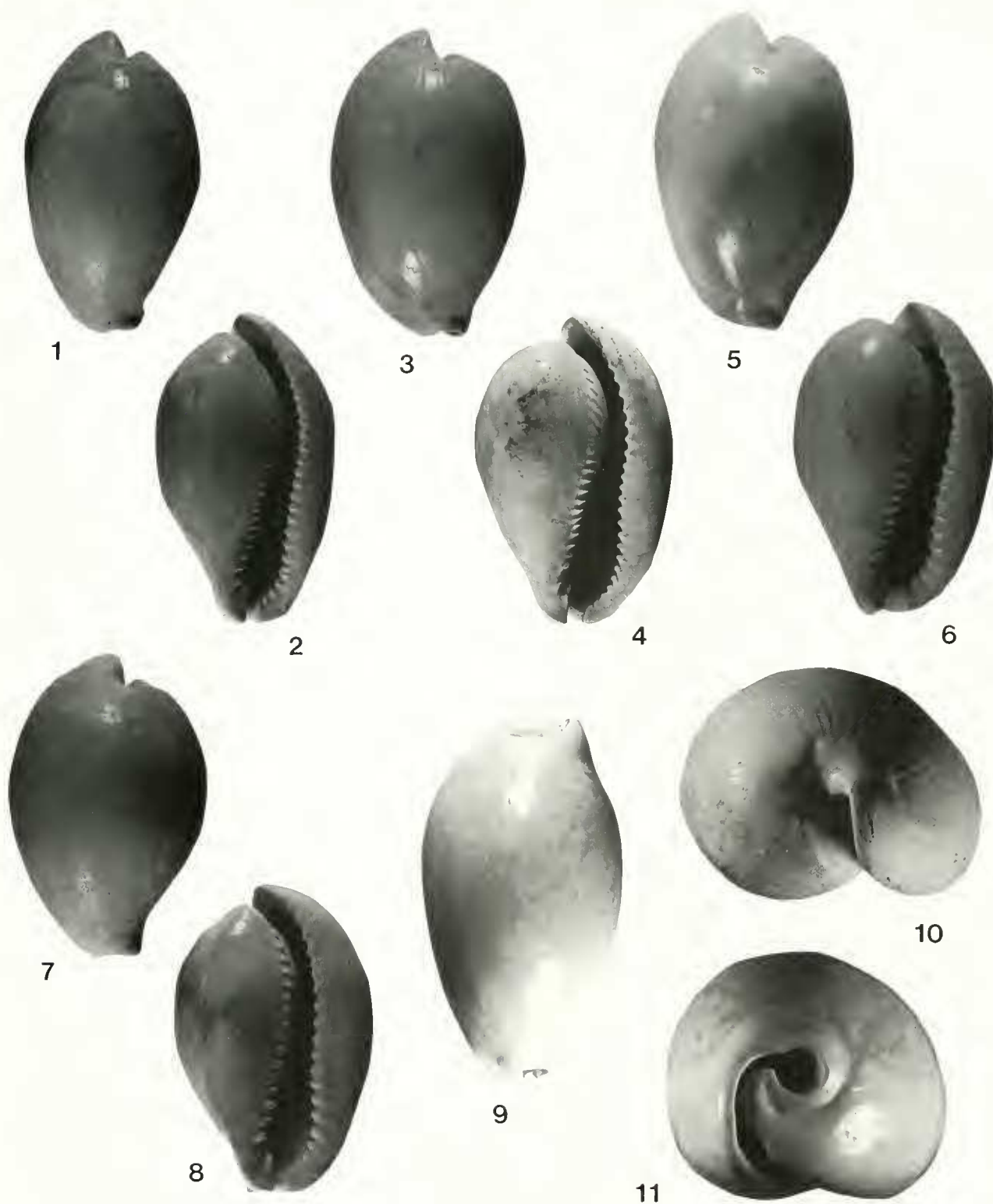
Type Material: Holotype, UF 68248, length 73 mm, width 43 mm; 2 paratypes, lengths 75 mm and 72 mm, Graves Museum of Archaeology and Natural History, Dania, Florida; 3 paratypes, lengths 75 mm, 73 mm, and 68 mm, collection of the author, Florida Atlantic University.

Type Locality: Pinecrest Beds Fauna (Petuch Unit 7), Tamiami Formation, in Phase 7 pit, Quality Aggregates, Inc., Sarasota, Sarasota County, Florida.

Remarks: *Calusacypraea briani* is the most elongated and cylindrical species in *Calusacypraea*. It is most similar to the older *C. duerri* from Petuch Unit 10, but differs in having a much narrower aperture, in having proportionally larger and coarser teeth on the outer lip, and in having smaller and less elongated teeth on the columellar lip. The posterior columellar extremity of *C. briani* is also better-developed and larger than that of *C. duerri*, producing a much more distinct posterior sulcus.

Calusacypraea briani was collected from sediments that indicate a very shallow, quiet, intertidal mud flat

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Figures 1–11. Species of *Calusacypraea*, new genus, from the coastal lagoonal environments of the Pliocene Okeechobean Sea. **1,2.** *Calusacypraea briani*, new species, holotype (length 73 mm), Pinecrest Beds Fauna (Petuch Unit 7), Tamiami Formation. **3,4.** *Calusacypraea duerri*, new species, holotype, length 64 mm, Pinecrest Beds Fauna (Petuch Unit 10), Tamiami Formation. **5,6.** *Calusacypraea sarasotaensis* (Petuch, 1994), length 42 mm, specimen from the Pinecrest Beds Fauna (Petuch Unit 3), Tamiami



Formation, APAC pit, Sarasota. 7,8. *Calusacypraea tequesta*, new species, holotype, length 73 mm, Pinecrest Beds Fauna (Petuch Unit 4), Tamiami Formation. 9. *Siphocypraea problematica* Heilprin, 1886, length 56 mm, specimen from the Caloosahatchee Fauna, Okeechobee Formation, in the Cochran Pit, La Belle, Hendry County. Type species of *Siphocypraea* Heilprin, 1886. 10. Apical view of *Calusacypraea duerri*, new species (type species of *Calusacypraea*), showing details of apical pit morphology. 11. Apical view of *Siphocypraea problematica*, showing details of apical sulcus morphology.

environment and was found with other estuarine species such as *Echinofulgur dalli* Petuch, 1994, *Cymatophos lindae* Petuch, 1991, and *Busycon tropicalis* Petuch, 1994.

Etymology: Named for my son, Brian N. Petuch, one of my best field assistants.

Calusacypraea duerri new species
(figures 3, 4)

Description: Basic morphology as for genus; shell very inflated, rounded, ovate; aperture wide, flaring toward anterior end; columellar lip with 24 small, narrow, and elongated teeth; posterior columellar teeth less developed than anterior teeth, frequently bifurcated; outer lip with 23 small teeth; base of shell rounded; margins poorly developed; apical pit deep; posterior columellar extremity small, low, poorly-developed.

Type Material: Holotype, UF 68249, length 64 mm, width 40 mm; 3 paratypes, 72 mm, 66 mm, and 65 mm, Graves Museum of Archaeology and Natural History, Dania, Florida; 3 paratypes, lengths 70 mm, 65 mm, and 61 mm, collection of the author, Florida Atlantic University; 1 paratype in the collection of Mr. Richard Duerr, Hollywood, Florida.

Type Locality: Pinecrest Beds Fauna (Petuch Unit 10), Tamiami Formation, in Phase 6 pit, Quality Aggregates, Inc., Sarasota, Sarasota County, Florida.

Remarks: *Calusacypraea duerri*, the type species of the genus, is most similar to the younger and stratigraphically-higher *C. sarasotaensis* (Petuch, 1994), but differs in being a much larger shell with more numerous and better-developed columellar and labial teeth. The apical pit of *C. duerri* is deeper and more impressed than that of *C. sarasotaensis*, and the posterior columellar extremity of the new species is much lower and more poorly-developed than that of the younger, descendant species.

Calusacypraea duerri was an inhabitant of a muddy-sand substrate, shallow water ecosystem dominated by the large bivalves *Mercenaria tridacnoides* (Lamarck, 1818), *M. ochloconeensis* (Mansfield, 1932), and *M. rileyi* (Conrad, 1838), and classic estuarine gastropods such as the melongenids *Tropochasca petiti* Olsson, 1967, *Echinofulgur cannoni* Petuch, 1994, and *Melongena taurus* Petuch, 1994, and large busyconids such as *Busycon filosum* Conrad, 1862, *B. tritonis* (Conrad, 1867), *B. pachyus* Petuch, 1994, *Sinistrofulgur hollisteri* Petuch, 1994, and *S. grabaui* Petuch, 1994.

Etymology: The new taxon honors Mr. Richard Duerr of Hollywood, Florida, who collected the holotype in Quality Aggregates Phase 6 pit.

Calusacypraea sarasotaensis (Petuch, 1994)
(figures 5, 6)

Original Description (from Petuch, 1994:271, as *Siphocypraea sarasotaensis*): "Shell small for genus, rounded, very inflated and bulliform; base of shell rounded, mar-

gins not produced; aperture proportionally very wide and open, becoming widest at anterior end; columellar lip with 14 small, poorly-developed teeth; outer lip with 19 small teeth; posterior sulcus poorly-developed, open, curving slightly to the left; extremities poorly-developed, very rounded; fossula nonexistent."

Type material: Holotype, UF66226, length 40 mm, width 18mm.

Type Locality: Pinecrest Beds Fauna (Petuch Unit 3), Tamiami Formation in APAC pit, Sarasota, Sarasota County, Florida.

Remarks:

Although originally described as coming from Petuch Unit 6, *Calusacypraea sarasotaensis* is now known to occur much higher stratigraphically, in Petuch Unit 3. The genus *Calusacypraea* becomes extinct after Unit 3 time, and *C. sarasotaensis* is the last-living member of its genus. It is also the smallest *Calusacypraea* species, averaging a length of only one-half that of the other three congeners. *Calusacypraea sarasotaensis* most closely resembles the much older, stratigraphically lower *C. duerri* from Petuch Unit 10, but differs in having a smaller and more rotund shell, fewer and coarser labial and columellar teeth, and a better-developed and more prominent posterior columellar extremity.

Colonies of *C. sarasotaensis* have been collected in muddy-sand faecies of Unit 3 along with characteristic estuarine species such as *Calophos nanus* Petuch, 1994, *Echinofulgur helenae* Olsson, 1967, and *Littorina lindae* Petuch, 1994.

Etymology: Named for Sarasota County, the general area of the type locality.

Calusacypraea tequesta new species
(figures 7, 8)

Description: Basic morphology as for genus; shell very inflated, bulliform, large for genus; aperture proportionally wide, becoming wider and more open toward anterior end; columellar lip with 19 large, prominent teeth; some columellar teeth bifurcate; outer lip with 22 large and prominent teeth; base of shell rounded; margins poorly-developed except in area bordering anterior end, where they become flattened and sharp-angled; apical pit very deep; posterior columellar extremity large and well-developed, thin and blade-like.

Type Material: Holotype, UF68250, length 73 mm, width 47 mm; 1 paratype, length 75 mm, Graves Museum of Archaeology and Natural History, Dania, Florida; 2 paratypes, lengths 75 mm and 72 mm, collection of the author, Florida Atlantic University.

Type Locality: Pinecrest Beds Fauna (Petuch Unit 4), Tamiami Formation, in APAC pit, Sarasota, Sarasota County.

Remarks: *Calusacypraea tequesta* is most similar, especially in its inflated, bulliform shell shape, to *C. duerri*

from Petuch Unit 10. The new species differs from the older, stratigraphically lower *C. duerri* in being a larger shell, in having fewer, larger, and coarser labial and columellar teeth, and in having better-developed and more flattened margins bordering the anterior end. *Calusacypraca tequesta* has the coarsest dentition of the four known species of *Calusacypraca*. This new species is a component of the rich estuarine fauna found in Petuch Unit 4 in the Sarasota quarries ("Black Layer"), where it is collected with *Siphocypraca metae* Petuch, 1994, *Pyrazisinus scalinus* (Olsson, 1967), *P. lindae* Petuch, 1994, *Cerithidca lindae* Petuch, 1994, *Bulla sarasotaensis* Petuch, 1994, *Melongena draperi* Petuch, 1994, and *Echinofulgur jonesae* Petuch, 1994.

Etymology: Named for the Tequesta Indian tribe of pre-Columbian southern Florida.

ACKNOWLEDGMENTS

I thank Mr. Richard Duerr, Hollywood, Florida, for assisting me in field collecting at Sarasota, Mrs. Cynthia Mischler, Department of Geology, Florida Atlantic University, for typing the manuscript, and Mr. Hugh Cannon, President, Quality Aggregates, Inc., Sarasota, Florida, for allowing me to collect in the Phases 6 and 7 pits.

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